

THE "FOUR C'S" -
COLD, CLEAN, COMPLEX, CONNECTED

COLD

TEMPERATURES NEEDED BY FISH	CUTTHROAT	STEELHEAD	CHINOOK	BULL TROUT	EXAMPLES OF AG PRACTICES THAT CAN AFFECT WATER TEMPERATURE
Spawning/Egg incubation	50°F	55-59°F	41-58°F	35-39°F	Removal of Riparian vegetation <ul style="list-style-type: none"> Grazing in riparian zones or wetlands Crop management in riparian zone/wetlands Inadequate riparian buffers Land clearing Burning ditches or riparian buffers Irrigation Practices, Water Management <ul style="list-style-type: none"> Rill or furrow irrigation Open ditches, canals, reservoirs Dams, water control structures Field runoff Ditch, canal, reservoir maintenance
Juvenile rearing	59°F	50-55°F	53-57°F	50-54°F	
Adults/Migration	<72°F	50-60°F	50-60°F	<60°F	
Degraded/Stressed	>64°F	>60°F	>60°F	>55°F	
LETHAL	82°F	73°F	79°F	73°F	

Temperatures in the shaded areas apply in agricultural landscape

CLEAN

INSTREAM FUNCTIONS	FUNCTIONAL	AT RISK	DEGRADED	EXAMPLES OF AG PRACTICES THAT CAN AFFECT SEDIMENTS AND WATER QUALITY
Sediments and Fines in gravel	<12% Fines low turbidity	12-17% west side 12-20% east side moderate turbidity	>17% west >20% east Exceeds TMDL standards High turbidity	Agricultural chemicals that enter the water by leaching, drift, surface runoff or other means <ul style="list-style-type: none"> Animal or farm waste management Field runoff Waste treatment, storage and transfer Irrigation Practices, Water Management <ul style="list-style-type: none"> Ditch maintenance Rill or furrow irrigation Open ditches, canals, reservoirs Sediment basin maintenance Removal of riparian vegetation (bank stability) <ul style="list-style-type: none"> Grazing in riparian zones or wetlands Crop management in riparian zone/wetlands Inadequate riparian buffers Land clearing Burning ditches or riparian vegetation Access Roads Stream or shoreline stabilization
Chemicals/Nutrients	Not 303d Impaired	Moderate levels of chemicals, 1 303d listed reach	High levels of nutrients, several 303d Listed*	
Substrate Embeddedness (Spawning and incubation areas)	<20% in Reach	20-30%	>30% in Reach	

* <5% of streams have been tested. All streams with listed fish must meet water quality standards.

COMPLEX

INSTREAM FUNCTIONS	FUNCTIONAL	AT RISK	DEGRADED	EXAMPLES OF AG PRACTICES THAT CAN AFFECT INSTREAM HABITAT COMPLEXITY
Stream Geometry	Stream meanders are appropriate for channel and landform type Off channel habitats	Stream channelized in sections, banks stabilized Some loss of off-channel habitats	Stream severely channelized and straightened. Stream is entrenched. No off-channel areas	<p>Majority of the Irrigation and Water Management Practices, especially:</p> <ul style="list-style-type: none"> • Straightening channels • Water diversions and conveyances • Ditches, dikes, canals, laterals • Storage reservoirs <p>Instream or Stream-adjacent Activities</p> <ul style="list-style-type: none"> • Clearing wood from channel • Grade stabilization • Streambank and shoreline stabilization • Grassed waterways • Wetland/wildlife habitat projects <p>All of the practices that affect riparian vegetation, especially</p> <ul style="list-style-type: none"> • Grazing in riparian zones or wetlands • Crop management in riparian zone/wetlands • Riparian buffers <p>Access roads</p>
Width:Depth Ratio	≤10	10-20	>20	
Streambank Stability	>80% of reach is stable	50-80% streambank stability	<50% of reach is stable	
Large Wood (Particularly important in spawning and Juvenile Rearing Areas)	West Side: >80 pieces/mi >24" in diameter East Side: >20 pieces/mi >12" in diameter Plus adequate long-term source	Close to function condition but no source for future recruitment in riparian vegetation	Little or no instream wood Little or no potential source of wood materials from riparian vegetation	
Pool Frequency & Quality-Alluvial System (Adult holding, cover, overwintering, refugia)	At least 1 pool every 5-7 channel widths. At least 1 pool >3' deep per reach	Few deep pools Pools have little complexity and cover	Major reduction in pool frequency No pools >3' deep in reaches	
Instream Flows/Hydrology	Stream is in equilibrium Flows sort gravels Hydrograph follows seasonal patterns	Altered peak flows, baseflows and timing relative to undisturbed systems	Inadequate instream flows Hydrograph pattern in reversed by controlled flows	
Floodplain Connectivity	Overbank flows occur at least every 3-5 years	Reduced linkage to wetlands and off-channel areas	Severe reduction in floodplain connectivity Armored banks	
Watershed Condition - Roads	<2 mi/sq mile Few valley bottom roads	2-3 mi/sq mi Some valley bottom roads	>3 mi/sq mi Many valley bottom roads	

CONNECTED

INSTREAM FUNCTIONS	FUNCTIONAL	AT RISK	DEGRADED	EXAMPLES OF AG PRACTICES THAT CAN AFFECT FISH PASSAGE
CONNECTIVITY - Fish are able to get from the ocean to their spawning areas and juveniles can go to the sea	No man-made barriers preventing upstream or downstream migration of fish	Some barriers to fish passage Altered flows and changes in the drainage network and some unscreened diversions strand fish	Severe barriers to upstream and downstream migration Many unscreened diversions and impassable barriers Isolated populations	Impassable dams Reservoirs with introduced fish Unscreened diversions, ditches, canals Impassable culverts on access roads Water conveyance, diversion, & storage Tide gates or screens that block access to habitat

FUNCTION OF RIPARIAN VEGETATION

Low-gradient valley rivers and streams (alluvial) are wood-dominated self-sustaining systems on both sides of the Cascades. Historic natural riparian vegetation consisted of trees and woody shrubs. Beaver dam complexes influence water table and create wetlands, backwater areas channel meanders.

Average site potential tree heights

- Eastern Washington 120 feet
- Western Washington 175 feet
- High elevation 90 feet

**RIPARIAN FUNCTIONS RELATIVE TO
DISTANCE FROM STREAM:**

	30% TREE HEIGHT	HALF TREE HEIGHT	75% TREE HEIGHT	1-2 TREE HEIGHTS
Root Strength and bank stability	50-60%	60-90%	90-100%	
Soil Moisture	80-90%	100%		
Leaf Litter and Organic Material Contribution (needed for fish feeding)	50-60%	60-90%	100%	
Shade (Highly dependent on stream width and topography)	40-50%	50-60%	60-90%	>90%
Trees falling into stream and contributing large wood to the system (highly dependent on slope, topography, stream width, and channel migrations in the floodplain)	<40%	40-60%	60-80%	80-100%